



SEG WORKSHOP
***Depth Model Building:
Full-waveform Inversion***

Beijing, China • 18-19 June 2015

***2015 SEG Depth Model Building:
Full-waveform Inversion Workshop***
2015 SEG 深度域建模：全波形反演研讨会

Official Program
会议指南

*Beijing, China
18-19 June 2015*

中国 • 北京

2015年6月18-19日

Host: Society of Exploration Geophysicists (SEG)

Co-host: Research Institute of Petroleum Exploration & Development
(RIPED), CNPC

主办方：国际勘探地球物理学家学会

协办方：中国石油勘探开发研究院

ONSITE INSTRUCTIONS 参会须知

- The onsite registration opens:
 - Wednesday, 17 June, 14:00-20:00, Lobby, Mengxi Hotel
 - Thursday, 18 June, 08:00-09:00, 1st Floor, Technology Meeting Center, RIPED, CNPC

现场注册/报到日期及地点为：

 - 6月17日，周三，14:00-20:00，梦溪宾馆一层大厅
 - 6月18日，周四，08:00-09:00，中国石油勘探开发研究院科技会议中心一层大厅
- All the oral sessions are held in the Report Room, 2nd Floor, Technology Meeting Center, RIPED, CNPC
口头报告地点：中国石油勘探开发研究院科技会议中心二层报告厅
- The poster session is held in the Lobby, 1st Floor, Technology Meeting Center, RIPED, CNPC
张贴报告地点：中国石油勘探开发研究院科技会议中心一层大厅
- The dinning place of the buffet lunches is Mengxi Restaurant. Meal tickets will be required.
会议期间的自助午餐地点：梦溪食府，用餐时须使用会议午餐券

IMPORTANT CONTACT INFORMATION 重要联络方式

- Meeting Venue: Technology Meeting Center, RIPED, CNPC
 - Address: No.20 Xueyuan Road, Haidian District, Beijing, China
 - Tel: 86 10 83592329

会议场地：中国石油勘探开发研究院科技会议中心

 - 地址：中国北京市海淀区学院路20号
 - 电话：86 10 83592329
- Recommended hotel: Mengxi Hotel
 - Address: No.20 Xueyuan Road, Haidian District, Beijing, China
 - Tel: 86 10 59933200

推荐住宿酒店：梦溪宾馆

 - 地址：中国北京市海淀区学院路20号
 - 电话：86 10 59933200
- SEG Onsite Staff 会务组联系人
 - Amelie Ma 马碧云, china@seg.org, +86 10 5820 5048-802(T), +86 18600753839(M)
 - Vicky Bai 白静, china@seg.org, +86 10 5820 5048-801(T), +86 13718125352(M)

ORGANIZING COMMITTEE 会议组织委员会



Prof. Jie Zhang (Chairman) is currently Director of Geophysical Research Institute at the University of Science and Technology of China (USTC), also serving as Chairman of SEG China Advisory Committee since 2011. He received his PhD in geophysics from MIT in 1996, and has been working in seismic industry and academia for over 20 years. He received SEG Reginald Fessenden Award in 2012 and SEG Outstanding Educator Award in 2015. His research interests include near surface imaging, full waveform inversion, and joint inversion.



Dr. Ru-Shan Wu (Co-Chairman) received his Ph.D. in geophysics in 1984 from MIT. Now he is a research geophysicist and the director of the Modeling and Imaging Laboratory, at the Institute of Geophysics and Planetary Physics, University of California, Santa Cruz. His current research interests include seismic wave propagation, scattering in heterogeneous media, fast methods for elastic wave modeling, scattering and attenuation, diffraction and scattering tomography, and imaging & inversion of wave field, especially in the compressed domain. He is the Corresponding Member of the European Academy of Sciences. He served as the Chairman of the IASPEI Sub-commission on Heterogeneity and scattering from 1997-2005, and a member of Standing Committee on Seismology and Geodynamics, Board on Earth Sciences and Resources, National Research Council from 2004-2007.

Members

Weiliang Dong, COSL

Xudong Jing, Shell China

Hong Liu, Institute of Geology and Geophysics, China Academy of Sciences (IGGCAS)

Sam Sun, China University of Petroleum (Beijing)

Xiaoming Tang, China University of Petroleum (East China)

Shoujun Wang, CNOOC

Lizhi Xiao, China University of Petroleum (Beijing)

Fengchang Yao, RIPED, CNPC

Yan Zhang, RIPED, CNPC

Yonggang Zhang, Sinopec

Bangliu Zhao, PetroChina

Huasheng Zheng, BGP

MEETING SCHEDULE 会议日程

Wednesday, 17 June

14:00–20:00..... **Onsite Registration**

Thursday, 18 June

08:00–09:00..... **Onsite Registration**

08:30–08:40..... **Opening Remarks**

08:40–09:10..... **Invited:** Iterative direct waveform inversion (IDWI) plus Fourier-domain full waveform inversion (FWI) by Changsoo Shin*, Jungmin Kwon, Seoul National University

09:10–09:40..... **Invited:** Full model wavenumber inversion (FMWI) by Tariq Alkhalifah, King Abdullah University of Science and Technology

09:40–10:00..... **Coffee Break**

Session I: Full-waveform Inversion Strategies (I)

10:00–10:20..... **Analysis of influence from short listening time for Laplace-domain waveform inversion** by Jungkyun Shin* and Changsoo Shin, Seoul National University

10:20–10:40..... **Reflection full-waveform inversion for inaccurate starting models** by Abdullah AlTheyab* and G. T. Schuster, King Abdullah University of Science and Technology

10:40–11:00..... **Reflection full waveform inversion using spatial correlation objective function** by Liangguo Dong*, Benxin Chi and Yuzhu Liu, School of Ocean and Earth Science, State Key Laboratory of Marine Geology, Tongji University

11:00–11:20..... **A nonlinear inversion for the velocity background and perturbation models** by Zedong Wu* and Tariq Alkhalifah, King Abdullah University of Science and Technology

11:20–11:40..... **Multisource elastic full waveform inversion method for irregular surface** by Yingming Qu*, Zhenchun Li, Jianping Huang, Qingyang Li, Jinli Li, School of Geosciences, China University of Petroleum (East China)

11:40–14:00..... **Lunch**

Session II: Real Data Cases of Joint Traveltime and Waveform Inversion

14:00–14:20..... **Joint seismic traveltime and waveform inversion** by Jie Zhang*, University of Science and Technology of China (USTC), Jing Chen, GeoTomo LLC

14:20–14:40..... **Application of joint seismic traveltime and waveform inversion for near surface velocity modeling on complex land data** by Linghe Han, Ziduo Hu, Yuchao Wang and Shujiang Wang Research Institute of Petroleum Exploration & Development-Northwest(NWGI), Petrochina

14:40–15:00..... **Imaging shallow complex structures in North Sea with joint traveltime and waveform inversion** by Hui Fan, Lee Bell, Geokinetics Inc., Yulong Deng*, Jie Zhang, University of Science and Technology of China

15:00–15:40..... **Coffee Break and Poster Session**

Posters

- P01 Multiple dual-variable grid encoding full time inversion based on an optimized encoding function** by Yingming Qu*, Zhenchun Li, Jianping Huang, Qingyang Li, Jinli Li, School of Geosciences, China University of Petroleum (East China)
- P02 Acoustic multiscale full waveform inversion of frequency domain based on gradient processing** by Changlu Sun*, Guangzhi Zhang, Xinpeng Pan and Xingyao Yin, China University of Petroleum (East China)
- P03 Acoustic multiscale full waveform inversion of frequency domain based on stable distribution** by Changlu Sun*, Guangzhi Zhang, Zhiming Zhang, Xinpeng Pan and Xingyao Yin, China University of Petroleum (East China)
- P04 Traveltime and waveform tomography of crosshole seismic data with cross-firing geometry** by Cheng Wang*, Jiangyun Pei, and Jianmin Wang, DPRI Daqing Oilfield Petrochina
- P05 Imaging complex land structures using joint traveltime and waveform inversion** by Wenbin Jiang*, Jie Zhang, University of Science and Technology of China (USTC)
- P06 Acoustic full waveform inversion with physical model data** by Jian Cai*, Jie Zhang, University of Science and Technology of China (USTC)
- P07 Robust full-waveform inversion with incomplete refraction** by Binghong He*, Guochen Wu, School of Geosciences, China University of Petroleum (East China)
- P08 Elastic wave modelling using a globally optimized implicit staggered-grid finite-difference scheme** by Yang Wang*, Hong Liu, Sheng Gui, Key Laboratory of Petroleum Resources, Institute of Geology and Geophysics, Chinese Academy of Sciences
- P09 Application of well logging control velocity depth domain modeling technology in the east of Tarim basin desert area** by Chongyang Yang*, Yubao Zhu, Chuntang Zhang, Qingling Wu and Hua Wu, Exploration and Development Institute, Daqing Oilfield Ltd, Co.

Session III: Waveform Envelop Inversions and Real Data FWI Cases

- 15:40–16:00..... **Joint traveltime and waveform envelope inversion** by Zhiyang Liu*, Jie Zhang, University of Science and Technology of China (USTC)
- 16:00–16:20..... **Seismic envelope inversion in elastic medium** by Guanchao Wang, Qizhen Du*, Chengfeng Guo, China University of Petroleum (East China)
- 16:20–16:40..... **Elastic envelope inversion using multicomponent seismic data without low frequency** by Chao Huang*, Liangguo Dong, Yuzhu Liu and Benxin Chi, State Key Laboratory of Marine Geology, Tongji University
- 16:40–17:00..... **Land data FWI case studies: Inner Mongolia and Pre-Caspian basin** by Wei Zhang* and Nanxun Dai, CNPC/BGP
- 17:00–17:20..... **The analysis of an FWI velocity model for potential shallow geohazard** by Rong Li, Hongyan Li, and Denes Vigh, Schlumberger

Friday, 19 June

- 08:30–09:00..... **Invited: Adaptive waveform inversion – FWI without cycle skipping** by Michael Warner, Imperial College London; Lluís Guasch, Gang Yao*, Sub Salt Solutions Limited
- 09:00–09:30..... **Invited: Renormalization and direct nonlinear FWI – Concept and progress review** by Ru-Shan Wu, Modeling and Imaging Laboratory, Earth

and Planetary Sciences, University of California, Santa Cruz

Session IV: Full-waveform Inversion Strategies (II)

- 09:30–09:50..... **Beat tone FWI for cycle-skipping suppression – Potentials and Challenges** by Wenyi Hu*, Advanced Geophysical Technology Inc
- 09:50–10:10..... **Coffee Break**
- 10:10–10:30..... **Multi-scale full waveform inversion with marine vertical cable data** by Aifei Bian* Jianchao Cai, China University of Geosciences (Wuhan); Zhihui Zou, Jin Zhang, Ocean University of China; Huawei Zhou, University of Houston
- 10:30–10:50..... **Background velocity model building by wave-equation reflection traveltimes tomography** by Bo Feng, Huazhong Wang, Hui Li, Wave phenomena and inversion imaging group (WPI), Tongji University
- 10:50–11:10..... **Simultaneous Multi-Parameter FWI based on truncated Newton method in acoustic VTI media** by Yi Wang*, Liangguo Dong, Yuzhu Liu, School of Ocean and Earth Science, Tongji University
- 11:10–11:30..... **Elastic full-waveform inversion of a sparse OBS dataset at the ultraslow spreading Southwest Indian Ridge evidence for an axial magma chamber** by Hanchao Jian*, Satish C. Singh and Yongshun John Chen, Institute of Theoretical and Applied Geophysics, School of Earth and Space Science, Peking University, Laboratoire de Géosciences Marines, Institut de Physique du Globe de Paris
- 11:30–11:50..... **Pseudo 2D elastic waveform inversion for velocity and Q factor in the near surface** by Yue Wang*, Jie Zhang, University of Science and Technology of China (USTC)
- 11:50–14:00..... **Lunch**

Session V: Full-waveform Modeling and Inversion Algorithms

- 14:00–14:20..... **Realization of Gauss-Newton direction for frequency-domain acoustic waveform inversion** by Yuzhu Liu*, Jizhong Yang, Benxin Chi, State Key Laboratory of Marine Geology, Tongji University
- 14:20–14:40..... **Acoustic multiscale full waveform inversion of frequency domain based on FCG** by Changlu Sun*, Guangzhi Zhang, Xinpeng Pan, Lanjie Jiang and Xingyao Yin, China University of Petroleum (East China)
- 14:40–15:00..... **Babich-expansion based Fast Huygens Sweeping Methods for Point-source Helmholtz Equations** by Wangtao Lu, and Jianliang Qian*, Michigan State University; Robert Burrige, University of New Mexico
- 15:00–15:20..... **Full waveform inversion in the damped frequency domain** by Wei Liu*, Yu-Chao Wang, and Zi-Duo Hu, Research Institute of Petroleum Exploration & Development-Northwest (NWGI), Petrochina
- 15:20–15:40..... **Coffee Break**

Session VI: Improvements in Full-waveform Inversions

- 15:40–16:00..... **A joint method of tomographic FWI combined with FWI** by Fang Ren, China University of Petroleum (East China), Z. Li, China University of Petroleum (East China)
- 16:00–16:20..... **Integration of digital rock physics and full waveform inversion for**

unconventional exploration by Wenhui Yu*, Aifei Bian, Wei Zhu, China
University of Geosciences (Wuhan)

16:20–16:40..... **Multi-parameter FWI in acoustic media based on the truncated Gauss-Newton method with a modified scattering-integral approach** by Jizhong Yang*, Yuzhu Liu, and Liangguo Dong, State Key Laboratory of Marine Geology, Tongji University

16:40–17:00..... **Efficient full waveform inversion using common mid-point gather in wavenumber-space-time domain** by Yunhui Park* and Sukjoon Pyun, Inha University, Changsoo Shin, Seoul National University

17:00–17:20..... **Waveform inversion using spectral decomposed signal with a single frequency component** by Jiho Ha*, Wookeun Chung and Sungryul Shin, Korea Maritime and Ocean University; Changsoo Shin, Seoul National University

INVITED SPEAKERS 特邀报告讲员



Changsoo Shin obtained Ph.D. degree in University of Tulsa in 1988 with thesis about nonlinear elastic wave inversion by blocky parameterization. Since then, he had served as a consultant in Amoco Production Company (1985-1998), lecturer in Hanyang University (1988-1991), and senior researcher in Korean Institute of Geoscience and Mineral Resources. In 1996, Changsoo Shin joined Seoul National University and has published 98 papers in international journals, most of them are related with waveform inversion until now. He is an active member in SEG and EAGE, and a member of editor board in Journal of Seismic Exploration.



Tariq A. Alkhalifah is a professor in the Physical Sciences and Engineering Division. He joined KAUST in June 2009. Before he joined KAUST, Alkhalifah was research professor and director of the Astronomy and Geophysics Research Institute at King Abdulaziz City for Science & Technology (KACST). Previously, he held the positions of associate research professor, assistant research professor, and research assistant at KACST. From 1996 to 1998, Alkhalifah served as a postdoctoral researcher for the Stanford Exploration Project at Stanford University, United States. He received the J. Clarence Karcher Award from the Society of Exploration Geophysicists (SEG) and the Conrad Schlumberger Award from the European Association for Geoscientists & Engineers (EAGE) in 2003, and honorary lecturer for the SEG in 2011. Alkhalifah is a member of SEG and of EAGE. Alkhalifah received his doctoral degree in geophysics and his master's degree in geophysics, both from the Colorado School of Mines, United States. He holds a bachelor's degree in geophysics from King Fahd University of Petroleum and Minerals, Saudi Arabia.